

M21448X

INSTRUCTION MANUAL
FOR
MODEL TTS 85A
CONNECTION
APPRAISAL SET



NORTHEAST ELECTRONICS CORPORATION

P.O. BOX 649 — CONCORD, N.H. 03301

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ISSUE 2



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SECTION 1

DESCRIPTION

1.1 GENERAL DESCRIPTION. The Model TTS 85A is a level and noise measuring set designed primarily to simplify connection appraisal measurements but with features which make it useful for a wide range of transmission and noise measuring applications. The results of the measurement in decibels are displayed directly on the 3-digit readout with 0.1 dB resolution in the TONES measuring mode and with automatic rounding to the nearest whole dB for NOISE. The digital display has a dynamic range of 22.0 dB at any selected range. A measurement falling outside the selected range causes the digits to be extinguished. A plus or minus sign will remain to indicate the direction in which the attenuator should be readjusted. Two separate attenuators are used, one for tones and one for noise. No arithmetic is necessary by the operator since the digital display automatically incorporates the attenuator setting.

1.2 For most efficient connection appraisal procedure, the use of remote combination test lines such as the NEC TN 14 Model is recommended. In the AUTO mode, the TTS 85A automatically reads level (dBm) when a 1kHz tone is present at an input level of -25 dBm or greater. When the tone disappears, a noise measurement is made through a C message filter (dBrnC). The set may be switched out of the automatic mode to either the TONES or NOISE mode. A HOLD DISPLAY button permits the operator to lock any measurements in the display for as long as the button is depressed to facilitate reading.

1.3 A TEL SET/MON jack permits a dial or telephone set to be connected to the line through the DIAL/TALK key. After the dialing is complete, the operator positions

the DIAL/TALK key to the MEASURE mode and performs the measurements. The switchable hold coil maintains an off-hook condition, if required, in the MEASURE mode.

1.4 The input line connections are made to a balanced transformer with DC blocking to 100 volts of either polarity. The input transformer may be switched out for performing unbalanced measurements. Both 600 and 900 Ω input impedances are provided as well as a 100,000 Ω bridging impedance.

1.5 MECHANICAL DESCRIPTION. The Connection Appraisal Set is enclosed in a portable metal case with the set appropriately located for either horizontal or vertical position. The cover is a protection for the front panel during transit and is quickly detachable and provides suitable facilities to contain the ac power cord and/or patch cords. An optional dial unit, which is mounted in the cover, is available for use with the Connection Appraisal Set.

1.6 INSPECTION AND INSTALLATION. Upon receipt of the Connection Appraisal Set a mechanical and electrical inspection should be performed. The instrument should be inspected for proper electrical operation. The specifications for the TTS 85A are contained in Section 2. There are no special installation procedures for this instrument. The power supply is self-contained and the instrument operates from 115 Vac 50-60 Hz.

SECTION 2

SPECIFICATIONS

2.1 SPECIFICATIONS

TONES RANGE: +22 to -72 dBm

TONES ACCURACY: ± 0.1 dB ± 1 count

TONES FREQUENCY RESPONSE: 200 Hz to 20 kHz
 ± 0.1 dB

DETECTOR INTEGRATING TIME: Noise 400ms -
Tones 50ms

NOISE RANGE: 0 to +92 dBnC

NOISE WEIGHTING: C Message

NOISE ACCURACY: ± 1 dB (automatic rounding to
the nearest whole dB, tenths digit extinguished).

MAXIMUM INPUT LEVEL: 80 dBn for 0 to 40 dBn
ranges, 120 dBn for 50 to 80 dBn ranges

POWER: 115V ac

WEIGHT: $16\frac{1}{2}$ lb.

SIZE: 14" w x 12" h x 8" d

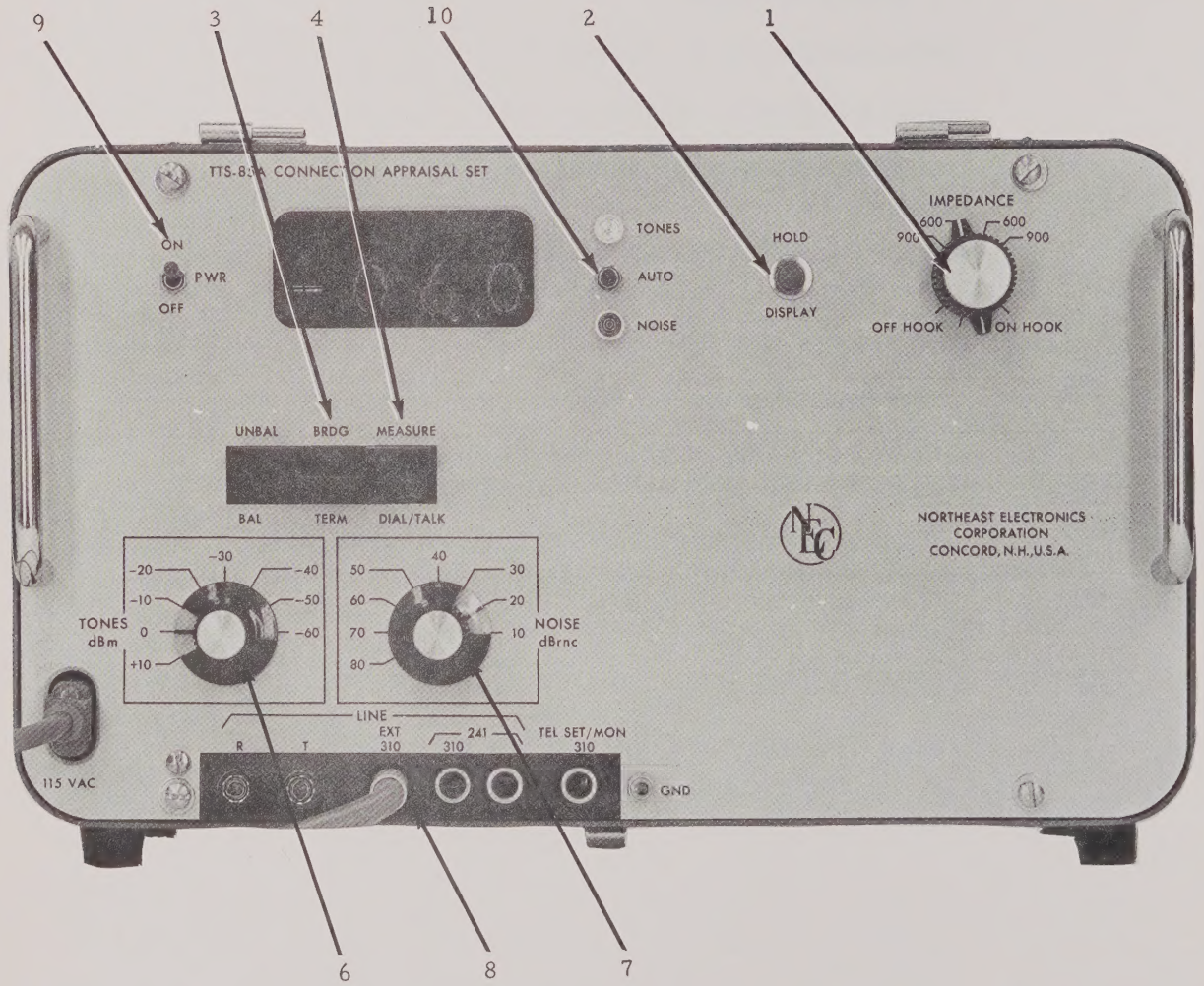


Fig. 3-1 Front Panel Controls

SECTION 3

OPERATING INSTRUCTIONS

3.1 FRONT PANEL CONTROLS. (See Fig. 3-1)

1. IMPEDANCE switch. The IMPEDANCE switch serves two purposes; (1) for selecting 600 or 900 Ω terminating impedance and (2) for selecting either ON HK or OFF HK operation.

2. HOLD DISPLAY Pushbutton. The HOLD DISPLAY button allows the operator to hold the display reading when the button is depressed.

3. BRDG/TERM Switch. When depressed, the BRDG/TERM switch allows the selected impedance to terminate the input. To bridge the line, place the BRDG/TERM switch to the BRDG position.

4. MEASURE DIAL/TALK. In the DIAL/TALK position, the line is applied to the TEL SET jack to enable the operator to dial and/or talk over the line. In the MEASURE position, the line is applied to the set for test measurements and the TEL SET jack is connected to monitor the line.

5. To release the pushbuttons, depress, then release.

6. TONES Attenuator. The tones attenuator is selectable from +10 dBm to -60 dBm, allowing measurements to be made from +22 dBm to -72 dBm. Each range setting has 22 dB dynamic range.

7. NOISE Attenuator. The noise attenuator is selectable from 80 dBrnC to 10 dBrnC, allowing measurements to be made from 92 to 0 dBrnC. The noise measurements are made through a C message filter, Each range has 22 dB dynamic range.

8. JACK BLOCK. The jack block allows connection to the set line via binding posts, type 310 or 241 plugs, and allows connection to the TEL SET or earphone via type 310 plug (the SLEEVE binding post allows access to all sleeve leads of the jack block). The GND binding post is chassis ground.

9. POWER Switch. An ON/OFF switch controlling the power to the unit. A 3AG $\frac{1}{2}$ amp fuse is included for the protection of the set. The fuse is located internally.

10. TONES/NOISE/AUTO Switch. When placed in the center position, the unit will automatically transfer from NOISE to TONES when the input signal level exceeds -25 dBm (at 1000 Hz). When placed up towards the TONES lamp, the unit constantly measures level, independent of the input. When placed down towards the NOISE lamp, the unit measures noise through a C message filter.

Section 3

3.2 OPERATION. To place the instrument in operation, connect the line cord to the 115 V ac socket on the front panel and connect to a suitable power source.

- a. Set the IMPEDANCE switch to the desired impedance, at the same time selecting either ON HK or OFF HK operation. OFF HK should only be used to hold the line.
- b. Depress the BRDG/TERM switch to the TERM position for making a terminating measurement. To bridge the line, place the BRDG/TERM switch in the BRDG position.
- c. Select either balanced or unbalanced operation with the BAL/UNBAL switch. Use the BAL position when working on the telephone line.
- d. Place the MEASURE DIAL/TALK switch to the DIAL & TALK position.
- e. Select the proper mode of operation with the TONES/NOISE/AUTO switch.

f. Set the TONES and NOISE attenuators to the desired range.

g. Connect the TEL SET to the line jacks.

h. Connect the TEL SET to the TEL SET/MON jack.

i. Turn the POWER switch on. The display should be blank at this time, except the + and - indicator.

j. Dial the desired number.

k. Upon connection, return the MEASURE DIAL/TALK switch to the MEASURE position.

l. To release the line, return the MEASURE DIAL/TALK switch to the DIAL/TALK position and place the TEL SET to ON HK.

SECTION 4

CIRCUIT DESCRIPTION

4.1 BLOCK DIAGRAM DESCRIPTION.

(Refer to the block diagram in Fig. 4-1.)

4.2 The Hold Network printed circuit board accepts the input signal from the line-in jacks and conditions the input signal, depending upon the position of switches S101, S102 and S103, for UNBAL or BAL, BRDG or TERM and to MEASURE or DIAL & TALK. In the MEASURE position, the Hold Network board transfers the input signal to the Impedance Converter/C Message Filter board, and to the Selective Detector/Control board.

4.3 The Selective Detector/Control board examines the input signal frequency which, at approximately 1000 Hz, conditions a relay for TONES measurements. In the Impedance Converter/C Message Filter board, the Impedance Converter offers a high impedance to the input signal and supplies 20 dB of gain. Preceding the Impedance Converter is a 40 dB attenuator. The C Message Filter board is used in NOISE measurement and supplies 20 dB of gain.

4.4 The Amplifier/Detector printed circuit board accepts the signal from the Impedance Converter for TONES measurements and from the C Message Filter for NOISE measurements. The AC amplifier develops the additional gain required for each attenuator setting. The average detector transforms the ac signal to a dc voltage, which is passed to the Digitizer-DB board.

4.5 In the Digitizer-DB board, the dc signal is converted to a binary code proportional to the log of the dc input. The binary signal is decoded to light the readout tubes with the proper digits.

4.6 DETAILED CIRCUIT DESCRIPTION.

4.7 HOLD NETWORK/CONTROL pc board E14-085-10-017. The input from the LINE jacks of the set is fed into the MEASURE DIAL/TALK switch, S101. In the DIAL/

TALK position, dial pulses may be sent over the line connected to the LINE jacks and the TEL SET/MON jack may be used with a telephone set for conversation over that line. In the MEASURE position the input is fed through the line blocking, non-polar capacitor, C101, to the BRDG/TERM switch, the set presents an input impedance of approximately 30,000 Ω . In the TERM position, under control of the IMPEDANCE switch, S4, input impedances of 600 or 900 Ω with on hook or off hook supervision are obtained.

4.8 With the IMPEDANCE switch in either of the off hook positions, a hold condition is placed across the tip and ring of the line connected to the LINE jacks.

4.9 In the TERM position of the BRDG/TERM switch, the input signal goes directly to the UNBAL/BAL switch, S103. In the UNBAL position, the ring conductor is grounded and the tip conductor is the signal lead. In the BAL position of this switch, the input transformer is inserted between the input circuitry and the line.

4.10 IMPEDANCE CONVERTER/C MESSAGE FILTER PC BOARD (E95235). The input signal coming into the impedance Converter passes directly to Q201, a field effect transistor, or through a 40 dB attenuator whose operation depends on the attenuator switch setting. Q201 and Q202 operate with negative feedback to supply 20 dB of gain. The Impedance Converter output is fed to the C Message Filter input via the Interconnection board (E95255). Q203 is an ac amplifier. Q204, Q205, Q206, Q207 and associated components make up the active C Message Filter. Q208 is an emitter follower. The C Message Filter contains an additional 20 dB of gain.

4.11 AMPLIFIER/DETECTOR PC BOARD (E95226). Signals arrive at the Amplifier Detector board via the Relay Control board

Section 4

9E95250). The Relay Control board samples the output of the C Message Filter for NOISE measurements and samples the output of the Impedance Converter, for TONES Measurements. IC301 is an operational amplifier incorporating negative feedback. The amplifier gain is selected by the attenuator switches. Q301, Q302, Q303 are the gain switching transistors. The output of IC301 is coupled to IC302 via C307, R315. IC302, an operational amplifier, combined with the bridge network of CR302, CR303, R320, R321, C311 and C312 performs the function of an absolute average detector. IC303, an operational amplifier, operates with negative feedback to supply the required dc gain and impedance conversion to drive the input circuitry of the Digitizer-DB board. C315, R326 control the integrating time of the detector.

4.12 DIGITIZER-DB PC BOARD (E95234).

The output from the detector is fed to the Integrated Circuit dc comparator IC401. IC401 contains two operational amplifiers. One half of IC401 compares the detector voltage and the signal from the exponential generator, the other half compares the signal from the exponential generator and a precision reference voltage. The outputs from the two comparators of IC401 are fed through R408, R407 to IC412, which produce logical output signals. Diodes CR407, CR408 clamp the output signals from IC401 to +5V. CR409, CR410 clamp IC401 output to approximately -0.7V.

4.13 IC411 accepts the output from IC412 and develops a gate signal whose pulse width depends on the amplitude of the signal being measured. IC413 is an integrated circuit operational amplifier which performs as a crystal oscillator (1MHz) whose output is coupled through C419 to IC411. IC411 gates the 1 MHz clock signal to develop a pulse burst containing a portion of the 1 MHz clock. IC410, IC409, IC408, divide by 10 counters, make up part of the divider chain. IC405 takes the preset binary coded decimal output from the attenuator switches and couples this information into the preset inputs of IC406 and IC407, a dual flip-flop. IC406 and IC407 complete the divider chain.

4.14 IC415, IC416, IC417, Integrated Circuit Decoder/Drivers, accept the binary coded decimal information from the driver chain, decode this information and drive the readout tubes for the proper decimal display. V404 is the tenths readout. V403 is the units readout and V402 is the tens readout. V401 is the + and - indicating readout.

4.15 Q403, Q405, Q412 and associated components make up a multivibrator which is synchronized with the 1 MHz clock. The output from Q403 is coupled to Q411 via R421. Q411 acts as a switch to supply -12V to the exponential timing capacitor C407. The exponential generator amplifies the charge and discharge rates of C407 to supply the system exponential. The output from Q403 of the multivibrator is also coupled through C414 to one half of IC404, which acts as a delay generator. This half of IC404 resets IC408, IC409 and IC410 and its output is coupled through C412 to the other half of IC404, which also acts as a delay mono. and its output allows the information at IC405 to be transferred to IC406, IC407. The output from Q405 of the multivibrator is coupled through R436 to Q406. Q406 switches the base of Q410 to ground during the reset time of the multivibrator. Q410 acts as a switch which opens the +170V supply line to V402, V403 and V404. This blanks the decimal reading portion of the readouts. IC402 samples and compares the two outputs of IC401 to develop the proper polarity signal to cause V401 to display a (+) or (-). When the control signal denoting the TONES mode of operation is present at CR403, Q402 is turned on lighting the TONES enunciator lamp. When this control signal is not present at CR403, Q401 is turned on, lighting the NOISE enunciator lamp.

4.16 RELAY CONTROL BOARD (E95250).

The Relay Control printed circuit board takes the information from the Selective Detector output relay and drives K601, K602, K603 and K604 for the proper mode of operation. (TONES or NOISE measurements.) K601 controls the binary coded decimal preset information from the attenuator switches for 2^0 and 2^1 . K602 controls

the binary coded decimal preset information from the attenuator switches for 2^3 and applies a control signal to either the TONES or NOISE attenuator, which in turn initiates the proper gain in the ac amplifier via CR601 - CR610. Q601, in conjunction with CR601 through CR604, determines when the 40 dB attenuator on the Impedance Converter/C Message Filter board will be used. K603 selects either the Impedance Converter output for TONES operation or the C Message Filter output for NOISE operation. It also selects the proper integrating time for the average detector. K604 selects the proper precision reference voltage for either TONES or NOISE operation and blanks the 10ths readout in the NOISE mode. IC601, Q602, Q603 and Q604 develop the proper over-range blanking information which is sent to the Digitizer-DB board.

4.17 INTERCONNECTIONS BOARD (E95255). The Interconnections printed circuit board contains the interwiring for three plug-in boards (Impedance Converter/C Message Filter, Amplifier/Detector and the Selective Detector/Control printed circuit boards). The Interconnections printed circuit board plugs into the Relay Control printed circuit board, allowing the plug-in circuit boards, the Interconnection printed circuit board and Relay Control board to be a modular package.

4.18 BLANKING PC BOARD (E95322). The Blanking printed circuit board contains only two components, K701 and C701. C701 is the NOISE mode integrating time capacitor. K701 develops the proper blanking information for the TONES and NOISE modes.

4.19 BCD OUTPUT PC BOARD (E95317). The BCD output printed circuit board contains the binary coded decimal outputs from the counter chain of the Digitizer-DB board. CR1001 through CR1003 develop the input signal for the Relay Control board over-range blanking circuitry.

4.20 SELECTIVE DETECTOR/CONTROL PC BOARD (E95237). The input signal transferred from the Hold Network/Control board is coupled through C501 and R501 to the high impedance input of Q501. Q501 is a field effect transistor acting as an emitter

follower. IC501 and IC502 and their associated components comprise the active tuned network. This network's maximum sensitivity is 1000 Hz. The output from Pin 10 of IC502 is coupled to C511 via the Interconnections board. CR501 and CR502 rectify and pass the positive going portion of IC502's output. Q502 and Q503 combined with their associated components comprise a Schmitt trigger. CR503 and CR504 condition the Schmitt trigger regardless of its input, to defeat the preset mode of operation by placing a ground on one or the other diode via the TONES/NOISE/AUTO switch, S2. The output from Q503, when high, turns on Q504, which in turn energizes K601 through K604 on the Relay/Control board. These relays condition the unit to measure in the NOISE mode. When (Q503's output is low, Q504 is held off, de-energizing K601 through K604 for TONES measurements.

4.21 POWER SUPPLY (E95340). The Power Supply printed circuit board accepts the ac voltages from the power transformer, T1, and develops the regulated dc voltages from the power transformer. The high voltage from the T1 is rectified by CR901 to CR 904 and passed through a low pass filter consisting of C901, R901 and C902, to develop the +170V dc supply voltage. CR906 and CR 907 rectify the positive portion of the power transformers low ac voltage. This positive dc voltage is filtered by C904. The positive 12V regulator is comprised of IC901, Q901 and Q902 and associated components. Q901 and Q902 provide a Darlington connected series regulated element. Q905, Q906, Q907 also sample the raw positive voltage and with the associated components comprises the +5V regulator. This +5V regulator is slaved to the -12V regulator supply via the network consisting of R925 CR918 and R926. CR905 and CR908 rectify the negative portion of the power transformers low ac voltage. IC902, Q903 and Q904 with their associated components comprise the -12V regulator, the positive 12V and negative 12V are slaved together via the network of R915 and R916. R913 provides a single adjustment for both output voltages (+12V, -12V). The resistor network of R921, R923, R924, R927, R928 and R929 comprise the precision reference voltage divider.

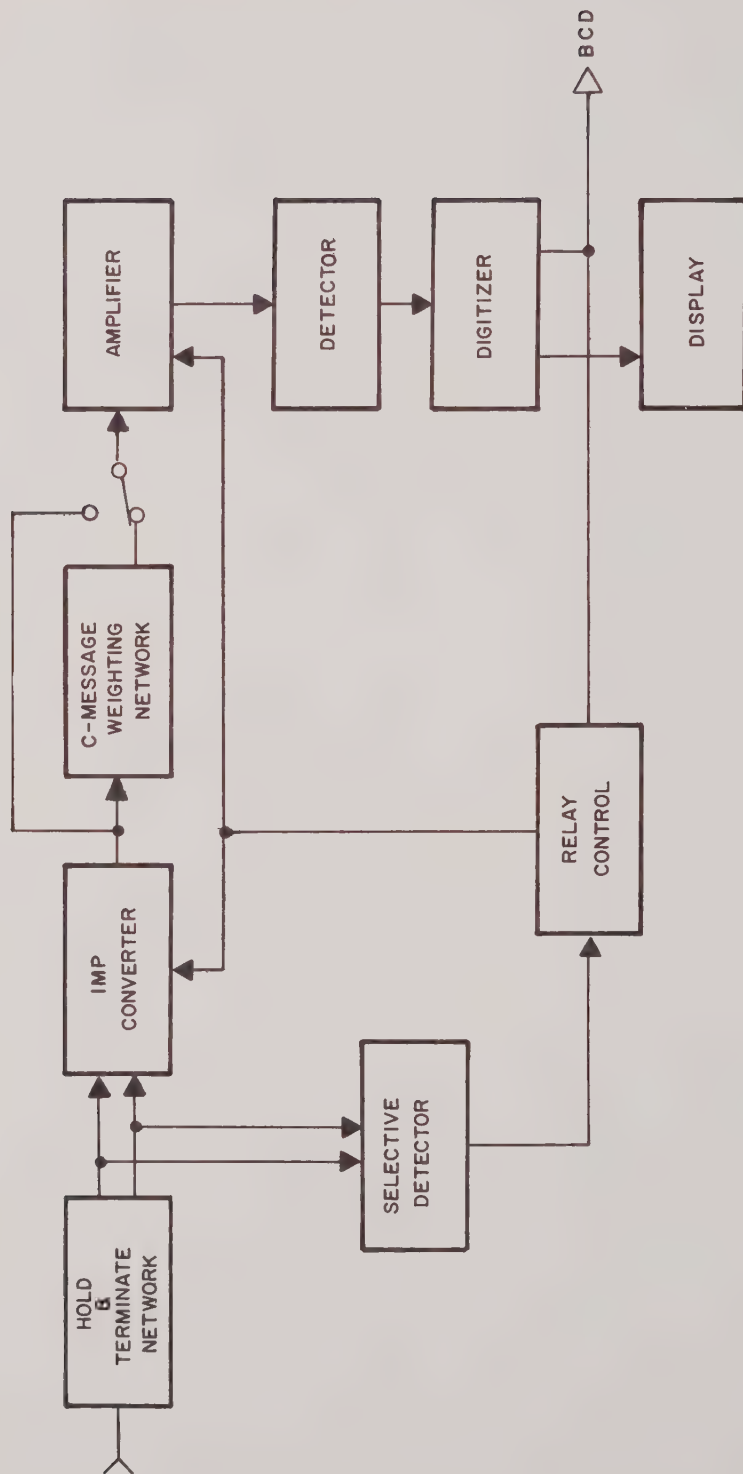


Figure 4-1 TTS 85A Block Diagram

SECTION 5

CALIBRATION

5.1 GENERAL. The TTS 85A Connection Appraisal Set is a stable set and should seldom require calibration other than accorded any test equipment. Calibration requires the use of precision test equipment which is not available in many offices. If such precision equipment is not available, the set should be returned to Northeast Electronics in Concord, N.H. for calibration.

NOTE

In performing the calibration, it is very important that the complete procedure is performed in strict sequence from beginning through the whole series of steps.

5.2 Test Equipment Required

Oscillator - NEC TTS 43A or WECO KS19353 or equivalent

Attenuator - 600 or 900 Ω with range of 0-72 dB, 1/10th dB steps. Daven type VT795G, model T or equivalent

VTVM - bridging impedance 100,000 Ω or greater -50 dB sensitivity. -NEC TTS 4C, or equivalent.

DC Voltmeter - capable of reading 12V.

5.3 Figure 5-1 is a schematic of the testing circuit for the calibration tests. The combination of jacks and binding posts for the input of the TTS 85A set makes it easy to connect the attenuator to the TTS 85A set and bridge the VTVM across the same input.

5.4 CALIBRATION PROCEDURE

a. Set the switches on the panel of the TTS 85A set as follows:

Switch	Position
IMPEDANCE	600 ON HK
UNBAL-BAL	UNBAL
BRDG-TERM	TERM
MEASURE-DIAL/TALK	MEASURE
The MODE Switch	TONES

b. Remove the unit from the case.

c. Connect 115V ac power to the 115V ac connector on the front panel and apply power by operating the PWR toggle switch to ON.

d. Check +12V and -12V voltages from Power Supply board E95240. These voltages may be checked on the board at the pins marked +12V, -12V and GND. If these voltages are in error, R913 may be adjusted to correct them.

e. Remove the quick disconnect pin marked ZERO-C located on the Digitizer board E95234 (mounted on the top of the unit).

f. Set the TONES dBm control at -50.

g. With the oscillator set to deliver 1 mW into 600 Ω at 1000 Hz, set the attenuator at -40.0 dB and readjust, if necessary, to obtain exactly -40.0 dB on the bridging VTVM.

h. The Amplifier-Detector board (E95226) is the middle plug-in card. If any adjustment is to be made, the card must be pulled out and plugged into a card extender (NEC part no. E95205) and reinserted. Place the negative probe of a dc voltmeter (set on its 10-volt scale) at the junction of resistor R326 (1K Ω) and capacitor C315 (10 μ F). Place the positive probe on the circuit ground. (Circuit ground is not the chassis).

Section 5

i. Adjust potentiometer R307 (5K) for a -7.8 volt reading on the dc voltmeter. This potentiometer is the one nearest the middle of the Amplifier-Detector board.

*Power off & Reinstall Bd
Place Power Supply*

j. The Power Supply board (E95240) is on the left end of the assembly as the testman faces the front panel of the set. Potentiometer R928 (2K) is the lowest one. Adjust this potentiometer while observing the digital display reading of exactly -40.0.

k. Adjust the input level for a -50.0 dB input at 1000 Hz. This should be done by changing the attenuator setting to 50 dB and making a slight readjustment of the oscillator, if necessary, to obtain exactly -50.0 dB on the VTVM.

l. The Digitizer-dB board (E95234) is the large pc board on the top of the unit. Potentiometer R425 (300K) is the right-hand potentiometer in the right rear corner of this board. Adjust R425 for an exact -50.0 digital display reading.

m. Adjust the input level for a -60.0 dB input at 1000 Hz. This should be done by changing the attenuator setting to 60 dB and making a slight readjustment of the oscillator, if necessary, to obtain exactly -60.0 dB on the VTVM. It is good practice occasionally to restore the attenuator to 0 and check to be sure that the oscillator is still sending 1 mW.

n. Potentiometer R416 (10K) is the left-hand potentiometer in the right rear corner of the Digitizer-dB board (E95234). Adjust R416 for an exact -60.0 digital display reading. When properly made, linearity should hold for every range.

o. Leaving the input signal at -60.0 dB, turn the TONES dBm control on the panel of the set to -60.

p. Locate R333 on the Amplifier-Detector board (E95226). Potentiometer R333 (500K) is toward the front of this board at the left-hand side. Adjust for an exact -60.0 digital display reading. Make a check in 1 dB steps from the input levels between -50 and -60 dB. Do not go lower than -60 since false readings may be obtained due to external pickups while the board is on the extender card and out of the case. If this adjustment is made properly, the digital should be -70.0 ± 0.2 for an input level of -70 dBm when the board is back in its place and the set is back in its case.

q. Adjust the input level to -40.0 dB at 1000 Hz and the TONES dBm control at -40.

r. Potentiometer R334 (100K) located on the Amplifier-Detector board is toward the front on the left-hand side of the board. Adjust it for an exact -40.0 digital display reading. The E95226 board should now be removed from the extender card and reinstalled in the unit.

s. Adjust the input level to -50.0 dB. The digital display reading should indicate -50.0 ± 0.1 .

t. Adjust the input level to -30.0 dB. The digital display reading should indicate -30.0 ± 0.1 .

u. Turn the TONES dBm control to -30.

v. Check the digital display reading for -30.0 ± 0.1 .

w. Set the input level at -20.0 dB turn the TONES dBm control to -20.

x. With a plastic tuning wand, inserted through the bottom right-hand hole of the card cage side-plate, adjust the trimmer capacitor C202 (8-30pf) to obtain -20.0 on the digital display. Because of the limited visibility, however, make sure that once the tuning wand has been removed the digital display is maintained at -20.0 dBm. Adjust the oscillator to

20 kHz and readjust C202 for exactly -20.0 dBm on the digital display. Recheck at 1000 Hz for -20.0 $\pm$ 0.1 dBm on the digital display. Recompensation may be necessary.

y. With the oscillator readjustment to 1000 Hz, set the TONES dBm control to the -10 range. The digital display should again read -20.0 $\pm$ 0.1 dBm.

z. Leaving the TONES dBm control at -10, change the input level to 0.0 dB. The display should be blank, leaving a + sign.

aa. Turn the TONES dBm control to 0.

ab. Locate potentiometer R924 on Power Supply board E95240. This potentiometer is located in the lower left corner of the board. Adjust it for exactly 00.0 digital display reading. The peak of adjustment is attained when the sign indicator is vacillating between + and -.

ac. Turn the attenuator to deliver +10 dBm and to -10 dBm into the 85A input while observing the digital readings. The reading should track the input signal.

ad. Set the TONES dBm control to +10 and set the input level to +10 dBm.

ae. Potentiometer R921 is located on the Power Supply board, which is on the left end of the assembly. This potentiometer is at the top of a group of three. Adjust R921 (100 Ω) to obtain an exact +10.0 digital display reading.

af. This completes the adjustment for the TONES dBm range. It is wise to make a few checks with random input levels to see if the digital display readings are correct throughout the range covered by the set.

ag. Operate the TONES/AUTO/NOISE toggle switch on the panel of the set

to NOISE.

ah. Turn the NOISE dBrnC control to 80.

ai. Readjust the attenuator to deliver 0 dBm to the 85A.

aj. The Impedance Converter-C Message board (E95235) is the bottom plug-in board of the assembly. Remove this board and install in the extender card. Potentiometer R217 is the only one on this board. Adjust for an exact +90 digital display reading.

ak. Return Impedance Converter/C-Message Filter board to card cage. Check all NOISE attenuator settings for correct tracking.

al. Reconnect the ZERO-C quick disconnect lead to the Digitizer board. Return the set to the case.

am. A complete linearity check should then be made for both the TONES dBm and NOISE dBrnC controls. Readjusting the input level at 1000 Hz, each range should be checked for 10 dB below and 10 dB above the selected range setting. Linearity should be within $\pm$ 0.1 dB for TONES dBm ranges and 1.0 dBrnC for the NOISE dBrnC ranges. The display for NOISE rounds off to the nearest whole dB. The digital display reading should indicate the input level with the exception of the blanking points for the select range. Table 5-1 gives the blanking points for each range.

5.5 Table 5-2 may serve to clarify the amplifications and pad controls which apply at the various positions of the TONES dBm and NOISE dBrnC controls.

5.6 The Selective Detector Board (E95237) is calibrated by the factory. Field calibration should not be attempted.

TABLE 5-1

NOISE dBrnC Range	Blanking Level			Blanking Level		
	Input			Input		
	dBm	dBrnC	Sign Remaining	dBm	dBrnC	Sign Remaining
+10	+22.0		+	00.0		-
0	+12.0		+	-12.0		-
-10	00.0		+	-22.0		-
-20	-10.0		+	-32.0		-
-30	-20.0		+	-42.0		-
-40	-30.0		+	-52.0		-
-50	-40.0		+	-62.0		-
-60	-50.0		+	-72.0		-

TONES dBm Range	Blanking Level			Blanking Level		
	Input			Input		
	dBm	Input	Sign Remaining	dBm	Input	Sign Remaining
80	+2.0	92	+	-20.0	70	-
70	-8.0	82	+	-30.0	60	-
60	-18.0	72	+	-40.0	50	-
50	-28.0	62	+	-50.0	40	-
40	-38.0	52	+	-60.0	30	-
30	-48.0	42	+	-70.0	20	-
20	-58.0	32	+	-80.0	10	-
10	-68.0	22	+	-90.0	0	-

TABLE 5-2

Range and Input dBm	Pad dB	Front End Amplifier				Amplifier-Detector	
		Sub- Total	Fixed Gain dB	Sub- Total		Gain dB	Total
-60	0	-60	+20	-40	+40	0	
-50	0	-50	+20	-30	+30	0	
-40	0	-40	+20	-20	+20	0	
-30	0	-30	+20	-10	+10	0	
-20	-40	-60	+20	-40	+40	0	
-10	-40	-50	+20	-30	+30	0	
0	-40	-40	+20	-20	+20	0	
+10	40	-30	+20	-10	+10	0	

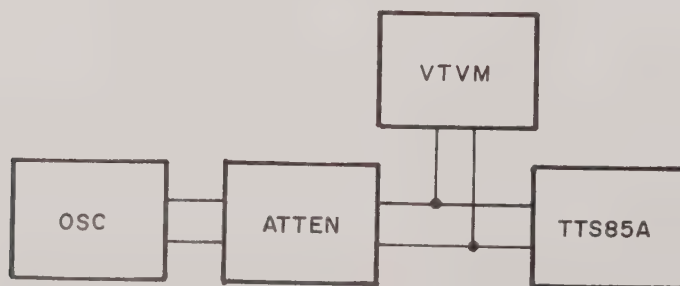


Figure 5-1 Test Set Up

SECTION 6

ELECTRONIC PARTS LIST

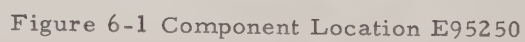
6.1 INTRODUCTION. The following pages contain the parts list for the Model TTS 85A.

6.2 FSCM Code Numbers. The Federal Supply Code of Manufacturers of each part. A list of codes and their respective manufacturers is given below.

LIST OF MANUFACTURERS

Code No.

01121	Allen Bradley Milwaukee, Wis.	53204
01295	Texas Instruments Inc. Dallas, Texas	75231
02660	Amphenol Corp Broadview, Ill	60153
03888	Pyrofilm Resistors Co., Inc. Cedar Knolls, N.J.	07927
05397	Union Carbide Corp. N.Y., N. Y.	10017
05844	Callins Industries Inc. Greenfield, Tenn.	38230
07716	IRC Div. of TRW, Inc. Burlington, Iowa	52601
12065	Transitron Electronic Corp. Boston, Mass.	02128
13606	Sprague Electric Co. Concord, N.H.	03301
15873	Motorola Inc. Arcade, N.J.	14009
18324	Signetics Corp. Sunnyvale, Calif.	94086
22650	Whale Electronics Nashville, Tenn.	
24446	General Electric Co. Schenectady, N.Y.	12305
31356	J-B-T Instrument Inc. New Haven, Conn.	06508
44655	Ohmite Mfg. Co. Skokie, Ill.	60076
49671	RCA Corp. N.Y., N. Y.	10020
71450	CTS Corp Elkhart, Ind.	46514
71590	Centralab Milwaukee, Wis.	53201
72982	Erie Technological Products Erie, Pa.	16512
75915	Littelfuse Inc. Des Plaines, Ill.	60016
80223	United Transformer Co. N.Y., N. Y.	10013
80368	Sylvania Electric Inc. N.Y., N.Y.	10017
81073	Grayhill Inc. La Grange, Ill.	60525
81095	Triad Transformer Corp Venice, Calif.	90293
82389	Switchcraft Inc. Chicago, Ill.	60630
83330	H.H. Smith Inc. Brooklyn, N.Y.	11207
83781	National Electronic Inc. Geneva, Ill.	60134
84171	ARCO Electronic Great Neck, N.Y.	11022
95073	Douglas-Randall Inc. Westerly, R.I.	02891



E95250 Relay Control Bd.

Ref Desig.	Description	Manufacturer (FSCM Code No)	Part Number
R601	R: 10K $\frac{1}{2}$ W	01121	RC20
R602	R: 100K $\frac{1}{2}$ W	01121	RC20
R603	R: 3.3K $\frac{1}{2}$ W	01121	RC20
R604	R: 100K $\frac{1}{2}$ W	01121	RC20
R605	R: 3.3K $\frac{1}{2}$ W	01121	RC20
R606	R: 100K $\frac{1}{2}$ W	01121	RC20
R607	R: 5.1K $\frac{1}{2}$ W	01121	RC20
R608	R: 10K $\frac{1}{2}$ W	01121	RC20
CR601-612	Diodes: silicon	12065	1N4148
IC601	IC Digital	01295	SN7476N
J601	PC Socket	02660	225-21521-110
K601	Relay	95073	24MC2C
K602	Relay	95073	24MC2C
K603	Relay	95073	24MC2C
K604	Relay	95073	24MC2C
Q601	Transistor: NPN silicon	49671	2N2102
Q602	Transistor: NPN silicon	49671	40327
Q603	Transistor: NPN silicon	15873	2N3903
Q604	Transistor: NPN silicon	15873	MPS 6515

Blanking Bd. E95317

C701	C: 250 μ F 50V	13606	39D257G050HE4
K701	Relay	83612	24MC2C

BCD Output - E95322

CR1001	Diode: silicon	12065	1N4148
CR1002	Diode: silicon	12065	1N4148
CR1003	Diode: silicon	12065	1N4148

Interconnection Bd. E95255

J801	PC Socket	02660	225-22223-110
J802	PC Socket	02660	225-22223-110
J803	PC Socket	02660	225-22223-110

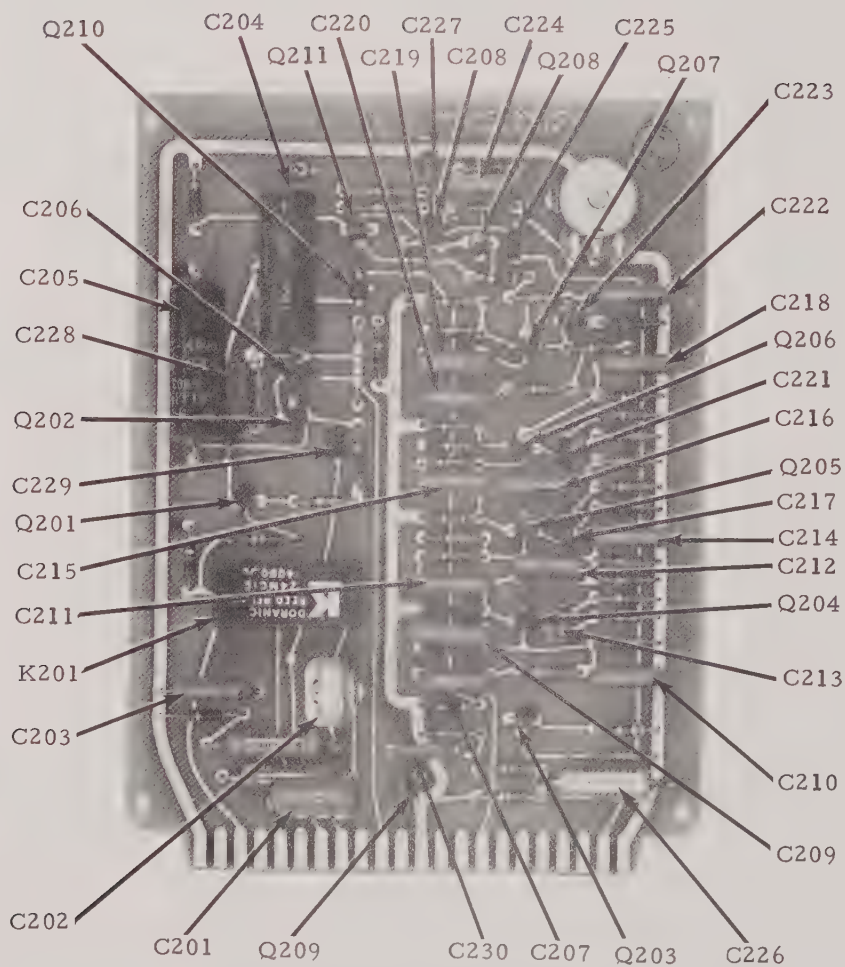


Fig. 6-2 Component Location E95235

PC Bd. E95235 Impedance Converter C-MSG Filter

Ref. Desig.	Description	Manufacturer (FSCM Code #)	Part Number
C201	C: 0.1 μ F 100V 10%	13606	225P10491
C202	C: 6-30pf var NPO	72982	3192-000-77E
C203	C: 0.0022 μ F 100V 10%	13606	225P22291
C204 and 205	C: 100 μ F 30V	05844	APD-095
C206	C: 22 μ F 6V	05397	K22W6K
C207	C: 0.01 μ F 100V 10%	13606	225P10391
C208	C: 22 μ F 6V	05397	K22W6K
C209	C: 0.0033 μ F 100V 10%	13606	225P33291
C210	C: 0.01 μ F 100V 10%	13606	225P10391
C211	C: 0.015 μ F 100V 10%	13606	225P15391
C212	C: 0.01 μ F 100V 10%	13606	225P10391
C213	C: 22 μ F 6V	05397	K22W6K
C214	C: 0.01 μ F 100V 10%	13606	225P10391
C215	C: 0.012 μ F 100V 10%	13606	225P12391
C216	C: 0.01 μ F 100V 10%	13606	225P10391
C217	C: 22 μ F 6V	05397	K22W6K
C218	C: 0.01 μ F 100V 10%	13606	225P10391
C219	C: 0.056 μ F 100V 10%	13606	225P56391
C220	C: 0.01 μ F 100V 10%	13606	225P10391
C221	C: 22 μ F 6V	05397	K22W6K
C222	C: 0.01 μ F 100V 10%	13606	225P10391
C223	C: 22 μ F 6V	05397	K22W6K
C224	C: 0.018 μ F 100V 10%	13606	225P18391
C225	C: 22 μ F 6V	05397	K22W6K
C226	C: 22 μ F 20V	13606	150D226X9020R
C227	C: 6.8 μ F 20V	05397	K6R8W20K
C228	C: 220pf silver mica	84171	CM-15-E-221J
C229	C: 10 μ F 10V	05397	K10W10K
C230	C: 1 μ F 25V	13606	5C13
K201	Relay: 1 form C	95073	24MC-1C
Q201	Transistor: FET	15873	MPF103
Q202 - 203	Transistors: PNP	15873	2N3905
Q204-207	Transistors: NPN	15873	MPS6515
Q208	Transistor: PNP	15873	2N3905
Q209	Transistor: NPN	15873	2N3903
Q210	Transistor: PNP	15873	2N3905
Q211	Transistor: NPN	15873	MPS6515

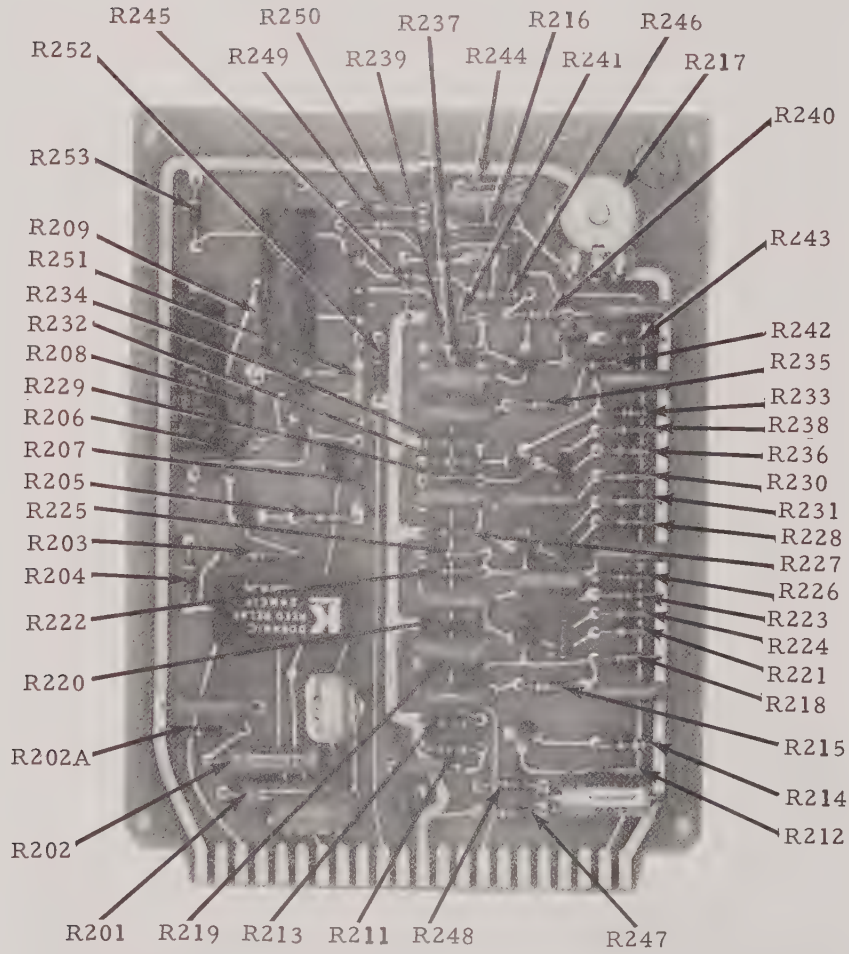


Fig. 6-3 Component Location E95235

PC Bd. E95235 (cont.)

Ref. Desig.	Description	Manufacturer (FSCM Code #)	Part Number
R201	R: 10M 1%	03888	PFR6751
R202	R: 100K 1%	03888	PFR6623
R202A	R: 2.2K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R203	R: 22K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R204	R: 10M $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R205	R: 5.6K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R206	R: 12K $\pm 5\%$ $\frac{1}{4}$ W	01121	RC07
R207	R: 2.2K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R208	R: 3.23K $\pm 1\%$ 1/8W	07716	CEATO
R209	R: 442 Ω $\pm 1\%$ 1/8W	07716	CEATO
R210	R: not used		
R211	R: 47K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R212	R: 68K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R213	R: 4.7K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R214	R: 3.9K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R215	R: 15K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R216	R: 430 Ω $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R217	R: 100 Ω $\pm 30\%$ $\frac{1}{4}$ W potentiometer	71450	SQ8514
R218	R: 68K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R219	R: 33K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R220-221	R: 6.8K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R222	R: 15K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R223	R: 100 Ω $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R224	R: 820 Ω $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R225	R: 33K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R226	R: 68K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R227-228	R: 6.8K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R229	R: 15K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R230	R: 100 Ω $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R231	R: 820 Ω $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R232	R: 33K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R233	R: 68K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R234	R: 6.8K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R235	R: 100 Ω $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R236	R: 6.8K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R237	R: 15K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R238	R: 820 Ω $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R239	R: 33K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R240	R: 56K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R241-242	R: 6.8K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R243	R: 820 Ω $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R244	R: 100 Ω $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R245	R: 3.9K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R246	R: 4.7K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R247	R: 22K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R248	R: 100 Ω $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R249	R: 22K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R250	R: 100 Ω $\pm 10\%$ $\frac{1}{4}$ W	01121	RC07
R251	R: 1.65K $\pm 1\%$ 1/8W	07716	CEATO
R252	R: 100 Ω $\pm 1\%$ 1/8W	07716	CEATO
R253	R: 1.5K $\pm 1\%$ 1/8W	07716	CEATO

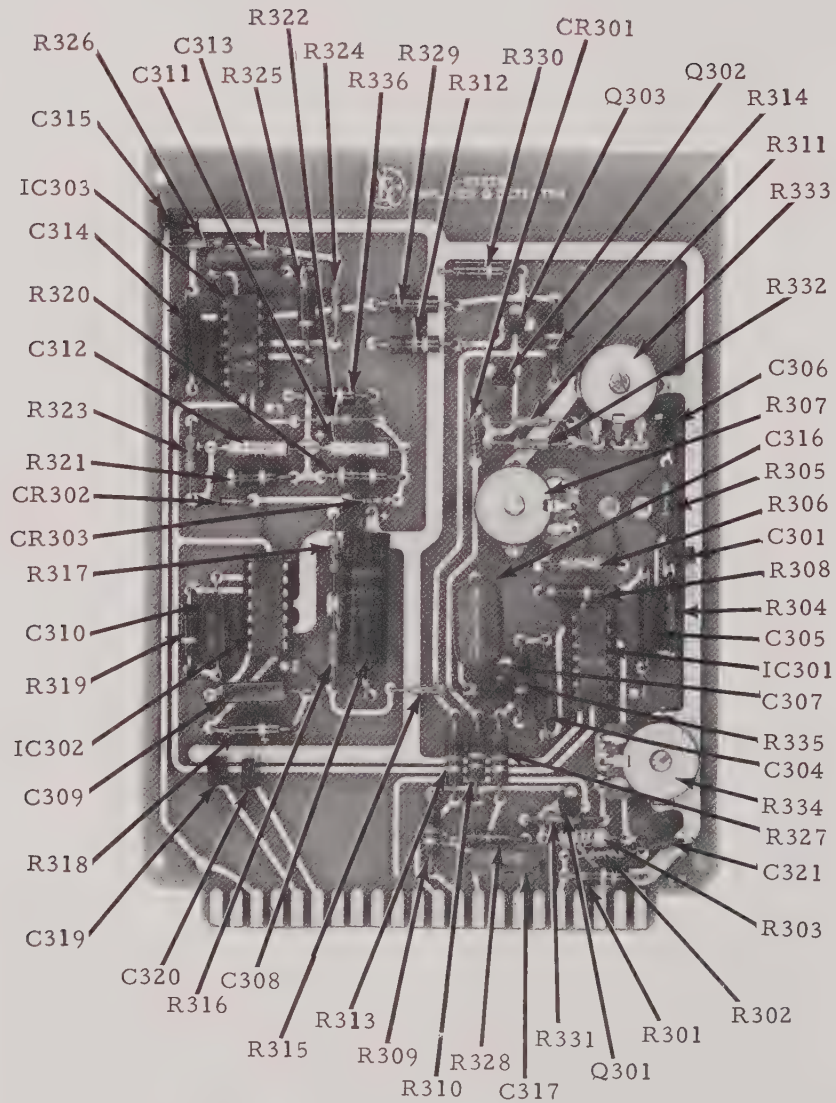


Fig. 6-4 Component Location E95226

PC Bd. E95226 - Amplifier/Detector

Ref Desig.	Description	Manufacturer (FSCM Code #)	Part Number
C301	C: 10 μ F 10V	05397	K10W10K
C302-303	C: not used		
C304	C: 5pf silver mica	84171	CM-15-E-050J
C305	C: 150pf silver mica	84171	CM-15-E-151J
C306	C: 10 μ F 10V	05397	K10W10K
C307	C: 22 μ F 6V	05397	K22W6K
C308	C: 50 μ F 20V	05844	APD-075
C309-310	C: 30pf silver mica	84171	CM-15-E-300J
C311-312	C: 10 μ F 20V	13606	150D106X9020R
C313	C: 0.0047 μ F 100V 10%	13606	225P47291
C314	C: 20pf silver mica	84171	CM-15-E-200J
C315	C: 10 μ F 10V	05397	K10W10K
C316	C: 0.22 μ F 75V	13606	225P2249R75
C317	C: 0.047 μ F 100V	13606	225P47391
C318	C: not used		
C319-320	C: 6.8 μ F 20V	05397	K6R8W20K
C321	C: 10pf NPO disc	86080	DD-100
R301	R: 100K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R302	R: 33.2K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R303	R: 3.92K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R304	R: 1.0K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R305	R: 15.4K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R306	R: 14.1K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R307	Pot: 5K $\pm 30\%$ $\frac{1}{4}$ W	71450	SQ8514
R308	R: 1.5K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R309	R: 10K $\frac{1}{2}$ W $\pm 10\%$	01121	RC20
R310	R: 100K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC20
R311	R: 4.32K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R312-313	R: 10K $\pm 10\%$ $\frac{1}{4}$ W	01121	RC20
R314	R: 100K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R315	R: 1.78K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R316-317	R: 20K 1% $\frac{1}{8}$ W	07716	CEATO
R318-319	R: 1.5K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R320-321	R: 4.7K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R322	R: 4.75K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R323-324	R: 84.5K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R325	R: 1.5K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R326	R: 1K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R327	R: 10K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R328	R: 680 Ω $\pm 10\%$ $\frac{1}{4}$ W	01121	RC20
R329	R: 1.6K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R330	R: 820 Ω $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R331-332	R: 33.2K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R333	Pot: 500 Ω $\pm 30\%$ $\frac{1}{4}$ W	71450	SR9318
R334	Pot: 100K $\pm 30\%$ $\frac{1}{4}$ W	71450	SW1818
R335	R: 100 Ω $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R336	R: 47 Ω $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
Q301-303	Transistors: NPN	15873	2N3903
IC301 & 303	IC Linear	12065	TOA2709P
IC302	IC Linear	49671	CA3030
CR301-303	Diodes	12065	1N4148

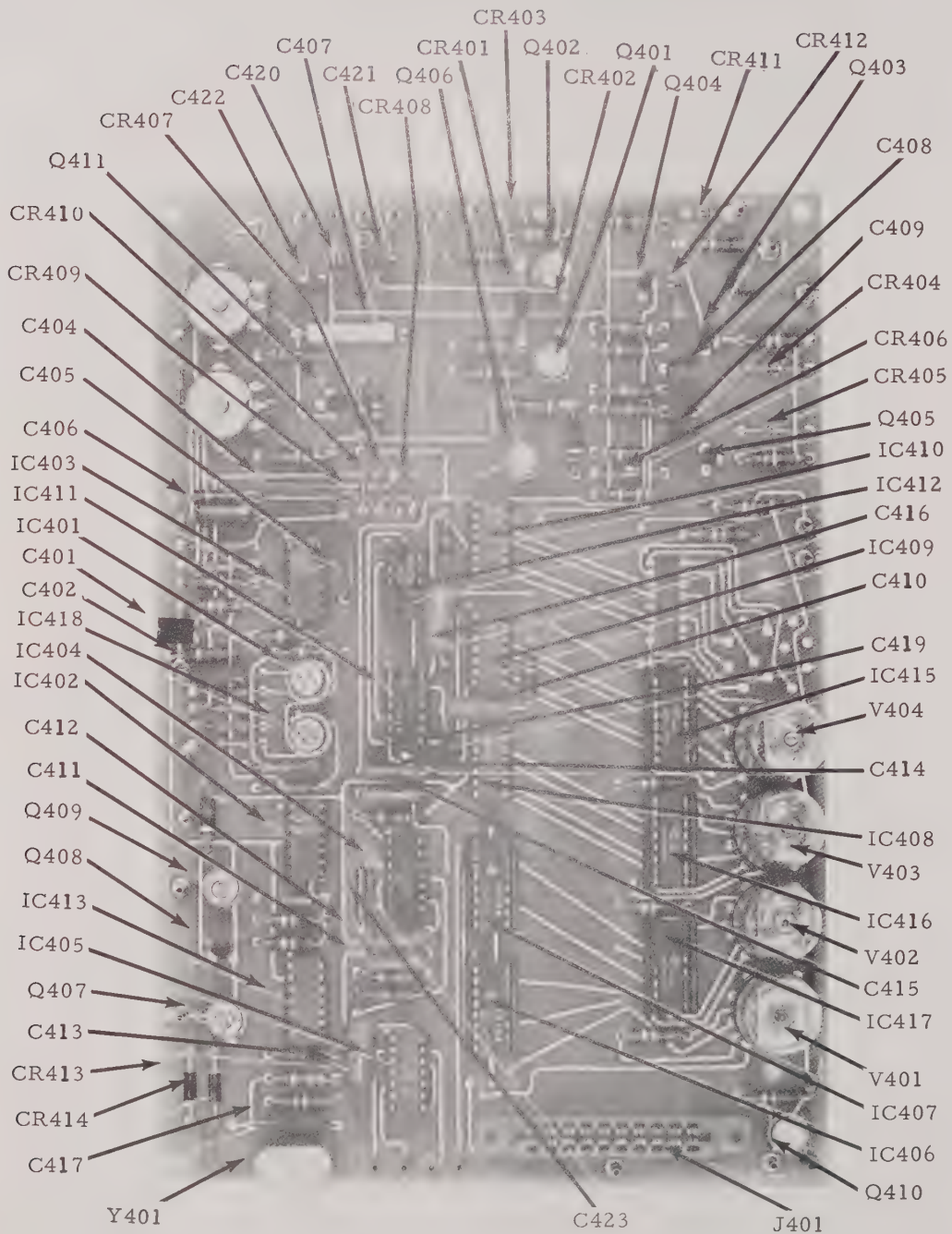


Fig. 6-5 Component Location E95234

PC Bd. E95234 - Digitizer

Ref Desig.	Description	Manufacturer (FSCM Code #)	Part Number
C401	C: 10 μ F 10V	05397	K10W10K
C402	C: 22pf silver mica	84171	CM-15-E-220J
C403	C: not used		
C404	C: 510pf silver mica	84171	CM-15-E-511J
C405	C: 20pf silver mica	84171	CM-15-E-200J
C406	C: 5pf silver mica	84171	CM-15-E-050J
C407	C: 0.01 μ F 35V 5%	13606	490P1035R35
C408	C: 2.2 μ F 35V 5%	05397	K2R2P35D
C409	C: 0.27 μ F 35V 5%	05397	KR27P35D
C410	C: 0.001 μ F 100V	13606	225P10291
C411	C: 0.01 μ F 100V	13606	225P10391
C412	C: 0.0022 μ F 100V	13606	225P22291
C413	C: 0.1 μ F 100V	13606	225P10491
C414	C: 0.0022 μ F 100V	13606	225P22291
C415	C: 0.01 μ F 100V	13606	225P10391
C416	C: 0.1 μ F 100V	13606	225P10491
C417	C: 100pf silver mica	84171	CM-15-E-101J
C418	C: not used		
C419	C: 2.2 μ F 25V	05397	K2R2W25K
C420-421	C: 4.7K 20V	05397	K4R7W20K
C422	C: 22 μ F 6V	05397	K22W6K
C423	C: 120pf	84171	CM-15-E-121J
IC401-403	IC Linear	12065	TOA2709P
IC404	IC Digital	15873	MC724P
IC405	IC Digital	01295	SN7400N
IC406-407	IC Digital	01295	SN7476N
IC408-410	IC Digital	01295	SN7490N
IC411	IC Digital	01295	SN7451N
IC412	IC Digital	15873	MC789P
IC413	IC Linear	49671	CA3030
IC414	not used		
IC415-417	IC Digital	01295	SN7441AN
IC418	IC Linear	12065	TOA2709P
J401	PC Socket	02660	225-21021-110
Q401-402	Transistors: NPN	49671	40327
Q403-405	Transistors: PNP	15873	2N3905
Q406-407	Transistors: NPN	49671	40327
Q408	Transistor: NPN	15873	2N3903
Q409-410	Transistors: NPN	49671	49327
Q411	Transistor: NPN	15873	2N3903
Y401	Crystal: HC6/U 1 mHz 0.005%		HC6/U 1 mHz
CR401	Diode	80368	1N2071
CR402-412	Diodes	12065	1N4148
CR413-414	Diodes	80368	1N2071
V401	Readout tube	83781	NL967
V402-404	Readout tubes	83781	NL964
V403	Readout tube	83781	NL965

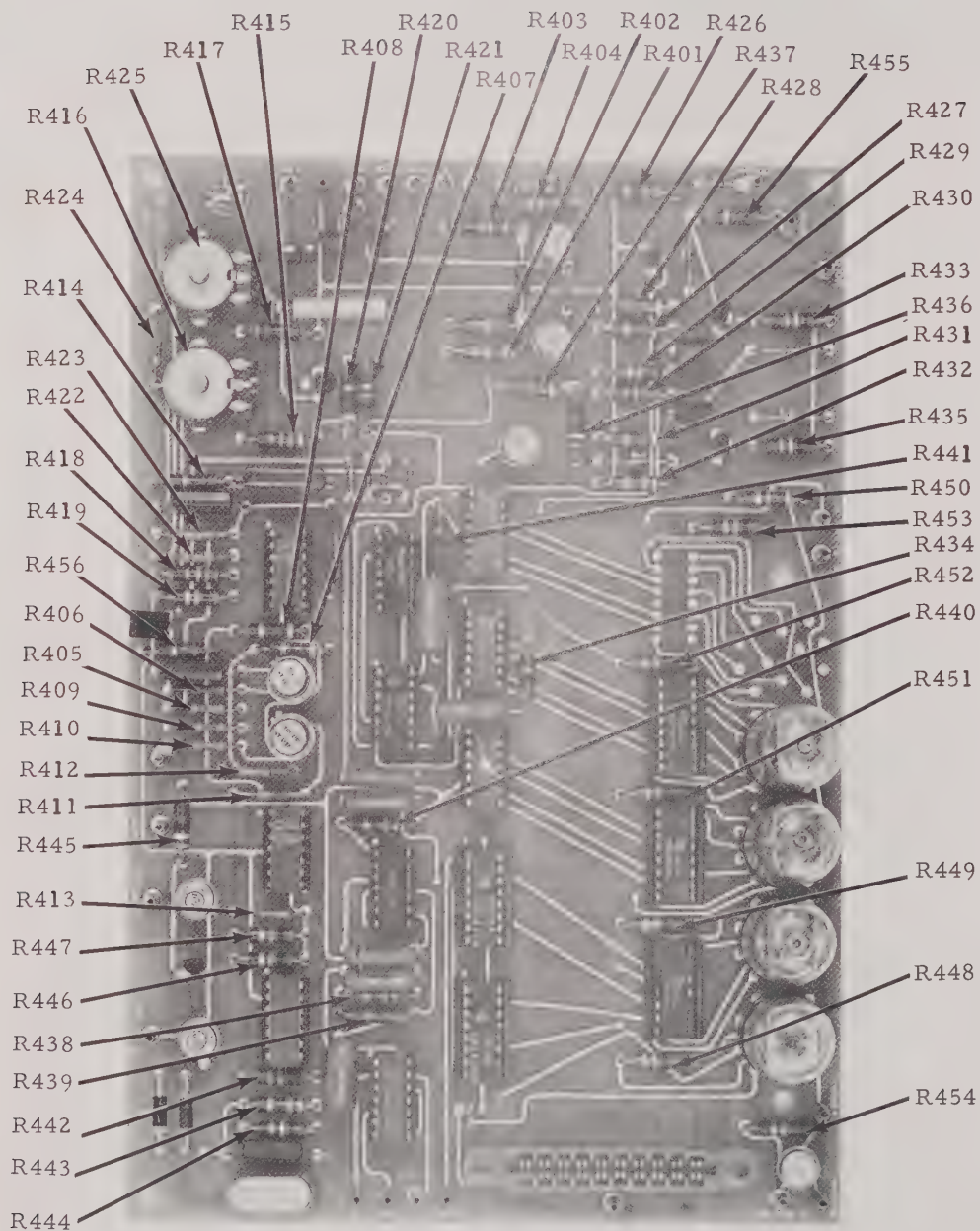


Fig. 6-6 Component Location E95234

PC Bd. E95234 (cont.)

Ref Desig.	Description	Manufacturer (FSCM Code #)	Part Number
R401	R: 30K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R402	R: 680K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R403	R: 30K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R404	R: 47K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R405-406	R: 10K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R407-408	R: 4.7K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R409-410	R: 10K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R411-413	R: 100K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R414	R: 1.5K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R415	R: 43K $\pm 5\%$ $\frac{1}{2}$ W	01121	RC20
R416	R: 10K $\pm 30\%$ $\frac{1}{4}$ W pot	71450	SQ8517
R417	R: 6.8K $\pm 5\%$ $\frac{1}{2}$ W	01121	RC20
R418	R: 160K $\pm 5\%$ $\frac{1}{2}$ W	01121	RC20
R419	R: 10K $\pm 5\%$ $\frac{1}{2}$ W	01121	RC20
R420	R: 4.7K $\pm 5\%$ $\frac{1}{2}$ W	01121	RC20
R421	R: 10K $\pm 5\%$ $\frac{1}{2}$ W	01121	RC20
R422	R: 113K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R423	R: 84.5K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R424	R: 232K $\pm 1\%$ $\frac{1}{8}$ W	07716	CEATO
R425	Pot: 300K $\pm 30\%$ $\frac{1}{4}$ W	71450	UPE200RE-1
R426	R: 3.3K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R427	R: 4.7K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R428	R: 470 Ω $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R429	R: 22K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R430	R: 18K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R431	R: 4.7K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R432	R: 3.3K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R433	R: 100K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R434	R: 8.2K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R435	R: 100K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R436	R: 3.9K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R437	R: 9.1K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R438	R: 3.3K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R439	R: 68 Ω $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R440	R: 3.3K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R441	R: 68 Ω $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R442	R: 20K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R443	R: 3.3K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R444	R: 100K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R445	R: 3.9K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R446-449	R: 10K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R450	R: 47K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R451-453	R: 10K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R454	R: 120K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R455	R: 1K $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20
R456	R: 560 Ω $\pm 10\%$ $\frac{1}{2}$ W	01121	RC20

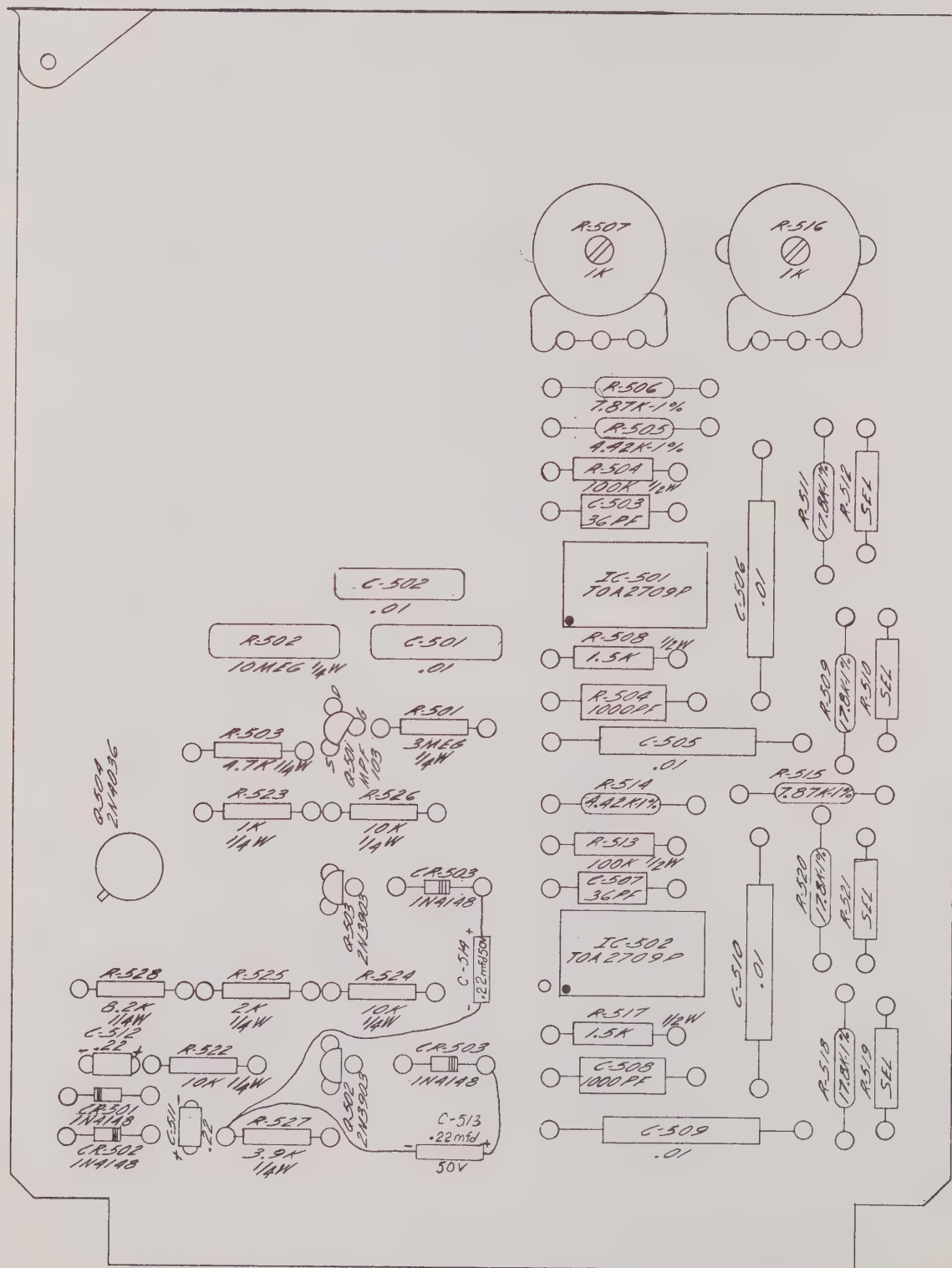


Figure 6-7 Component Location E95237

Selective Detector/Control Bd. E95237

Ref Desig.	Description	Manufacturer (FSCM Code No)	Part Number
C501	C: 0.01 μ F 100V	13606	225P10391
C502	C: 0.01 μ F 100V	13606	225P10391
C503	C: 36pf Silver Mica	84171	CM-15-E-360J
C504	C: 1000pf Silver Mica	84171	CM-20-E-102J
C505	C: 0.01 μ F 35V 5%	13606	490P1035R35
C506	C: 0.01 μ F 35V 5%	13606	490P1035R35
C507	C: 36pf Silver Mica	84171	CM-15-E-360J
C508	C: 1000pf Silver Mica	84171	CM-20-E-102J
C509	C: 0.01 μ F 35V 5%	13606	490P1035R35
C510	C: 0.01 μ F 35V 5%	13606	490P1035R35
C511	C: 0.22 μ F 50V	05397	KR22W50K
C512	C: 0.22 μ F 50V	05397	KR22W50K
R501	R: 3M Ω $\frac{1}{4}$ W 10%	01121	RC07
R502	R: 10M Ω $\frac{1}{4}$ W 10%	01121	RC07
R503	R: 4.7K $\frac{1}{4}$ W 10%	01121	RC07
R504	R: 100K $\frac{1}{2}$ W 10%	01121	RC20
R505	R: 4.42K 1/8W 1%	07716	CEATO
R506	R: 7.87K 1/8W 1%	07716	CEATO
R507	R: 1K var	71450	SR9320
R508	R: 1.5K $\frac{1}{2}$ W	01121	RC20
R509	R: 17.8K 1/8W 1%	07716	CEATO
R510	R: sel val $\frac{1}{2}$ W	01121	RC20
R511	R: 17.8K 1/8W 1%	07716	CEATO
R512	R: sel val $\frac{1}{2}$ W	01121	RC20
R513	R: 100K $\frac{1}{2}$ W	01121	RC20
R514	R: 4.42K 1/8W 1%	07716	CEATO
R515	R: 7.87K 1/8W 1%	07716	CEATO
R516	R: 1K var	71450	SR9320
R517	R: 1.5K $\frac{1}{2}$ W	01121	RC20
R518	R: 17.8K 1/8W 1%	07716	CEATO
R519	R: sel val $\frac{1}{2}$ W	01121	RC20
R520	R: 17.8K 1/8W 1%	07716	CEATO
R521	R: sel val $\frac{1}{2}$ W	01121	RC20
R522	R: 10K $\frac{1}{4}$ W 10%	01121	RC07
R523	R: 1K $\frac{1}{4}$ W 10%	01121	RC07
R524	R: 10K $\frac{1}{4}$ W 10%	01121	RC07
R525	R: 2K $\frac{1}{4}$ W 10%	01121	RC07
R526	R: 10K $\frac{1}{4}$ W 10%	01121	RC07
R527	R: 3.9K $\frac{1}{4}$ W 10%	01121	RC07
R528	R: 8.2K $\frac{1}{4}$ W 10%	01121	RC07
IC501	IC Linear	12065	TOA2709P
IC502	IC Linear	12065	TOA2709P
Q501	Transistor: FET N Channel	15873	MPF103
Q502	Transistor: NPN silicon	15873	2N3903
Q503	Transistor: NPN silicon	15873	2N3903
Q504	Transistor: PNP silicon	49671	2N4036
CR501-504	Diodes: silicon	12065	1N4148

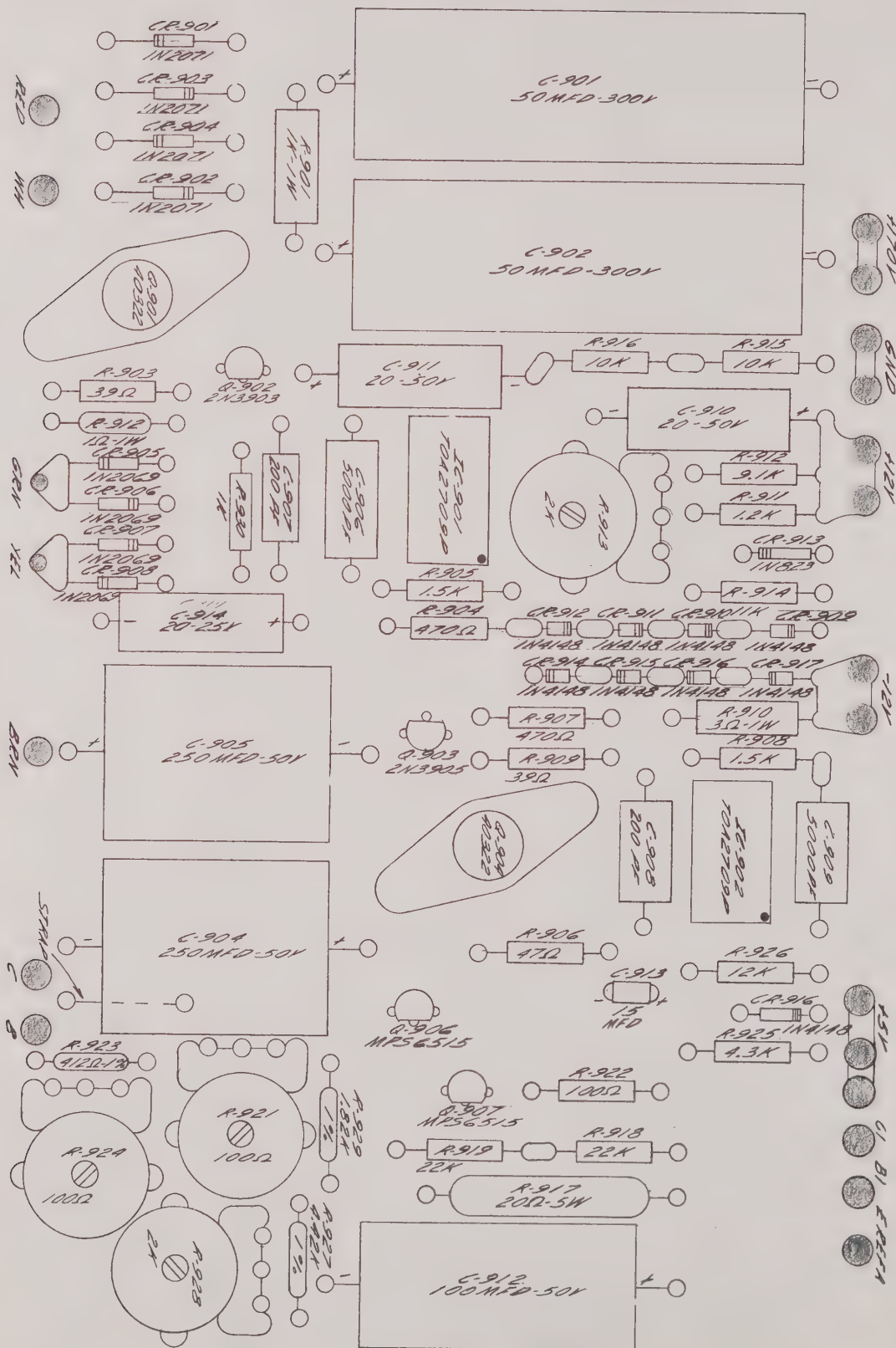


Figure 6-8 Component Location E95240

E95240 Power Supply

Ref Desig.	Description	Manufacturer (FSCM Code #)	Part Number
C901	C: 50 μ F 300V	13606	39D506F300GL4
C902	C: 50 μ F 300V	13606	39D506F300GL4
C903	C: 0.47 μ F 75V	13606	225P4749R75
C904	C: 250 μ F 50V	13606	39D257G050HE4
C905	C: 250 μ F 50V	13606	39D257G050HE4
C906	C: 5000pf	84171	CM-15-E-502J
C907	C: 22pf	84171	CM-15-C-220J
C908	C: 22pf	84171	CM-15-C-220J
C909	C: 5000pf	84171	CM-15-E-502J
C910	C: 20 μ F 50V	13606	TE1305
C911	C: 20 μ F 50V	13606	TE1305
C912	C: 100 μ F 50V	05844	APD-127
C913	C: 15 μ F 10V	05397	K15W10K
R901	R: 1K 1W 10%	01121	1K1W
R902	R: 1 Ω 1W 5%	13606	239E-1R05
R903	R: 39 Ω $\frac{1}{2}$ W	01121	RC20
R904	R: 470 Ω $\frac{1}{2}$ W	01121	RC20
R905	R: 1.5K $\frac{1}{2}$ W	01121	RC20
R906	R: 47 Ω $\frac{1}{2}$ W	01121	RC20
R908	R: 1.5K $\frac{1}{2}$ W	01121	RC20
R909	R: 39 Ω $\frac{1}{2}$ W	01121	RC20
R910	R: 3 Ω 1W	44655	4042
R911	R: 1.2K $\frac{1}{2}$ W	01121	RC20
R912	R: 9.1K $\frac{1}{2}$ W	01121	RC20
R913	R: 2K $\frac{1}{4}$ W 30% pot	71450	SW1817
R914	R: 11K $\frac{1}{2}$ W	01121	RC20
R915	R: 10K $\frac{1}{2}$ W	01121	RC20
R916	R: 10K $\frac{1}{2}$ W	01121	RC20
R917	R: 20 Ω 5W	13606	5BJ2005
R918	R: 22K $\frac{1}{2}$ W	01121	RC20
R919	R: 22K $\frac{1}{2}$ W	01121	RC20
R920	R: sel val 1/8W 1%	07716	CEATO
R921	R: 100 Ω $\frac{1}{4}$ W 30% pot	71450	SQ8514
R922	R: 100 Ω $\frac{1}{2}$ W 10%	01121	RC20
R923	R: 412 Ω 1/8W 1%	07716	CEATO
R924	R: 100 Ω $\frac{1}{4}$ W 30% pot	71450	SQ8514
R925	R: 4.3K $\frac{1}{2}$ W	01121	RC20
R926	R: 12K $\frac{1}{2}$ W	01121	RC20
R927	R: 4.42K 1/8W 1%	07716	CEATO
R928	R: 2K $\frac{1}{4}$ W 30% pot	71450	SW1817
R929	R: 1.82K 1/8W 1%	07716	CEATO
CR901-904	Diodes: silicon	80368	1N2071
CR905-908	Diodes: silicon	80368	1N2069
CR909-912	Diodes: silicon	12065	1N4148
CR913	Diode: silicon	15873	1N823
CR914-918	Diodes: silicon	12065	1N4148
Q901	Transistor: NPN	49671	40322
Q902	Transistor: NPN	15873	2N3903
Q903	Transistor: PNP	15873	2N3905

Power Supply cont.)

Ref Desig.	Description	Manufacturer (FSCM Code No)	Part Number
Q904	Transistor: NPN	49671	40322
Q905	Transistor: NPN	49671	40322
Q906	Transistor: NPN	15873	MPS 6515
Q907	Transistor: NPN	15873	MPS 6515
IC901	IC	12065	TOA2709P
IC902	IC	12065	TOA2709P
R907	R: 470Ω $\frac{1}{2}$ W	01121	RC20

Chassis Components

R1	R: 604Ω 1/8W 1%	07716	CEATO
R2	R: 900Ω 1/8W 1%	07716	CEATO
S1	S: DPDT Power	31356	JMT-223
S2	S: T-N-Auto	09353	7103
S3	S: Pushbutton	82389	903
S4	S: rotary 2 deck	86680	PA-1013
S5	S: rotary special 7 deck	86680	PA-022-A83904
S6	S: rotary special 4 deck	86680	PA-022-A83905
T1	Transformer: power	81095	R56A
T2	Transformer	80223	GR-815 or A20
XT2	Transformer shield	80223	A-33
J1	Jack: power receptacle	82389	AC-3G
J2	Jack: 310 type	82389	5J-1329
J3	Jack: 310 type	82389	5J-1329
J4	Jack: 310 type	82389	5J-1192
J5	Jack: 310 type	82389	5J-1329
J6	Jack: Binding post - blk	81073	29-1B
J7	Jack: Binding post - red	81073	29-1R
J8	Jack: Binding post - gnd	83330	137SP
J9	Jack: Binding post - blk	81073	29-1B
F1	Fuse: $\frac{1}{2}$ amp	75915	3AG- $\frac{1}{2}$
XF1	Fuse Holder	75915	357001

Front Panel

L1	Neon Lamp	91802	B2110A3
L2	Neon Lamp	91802	B2110A3

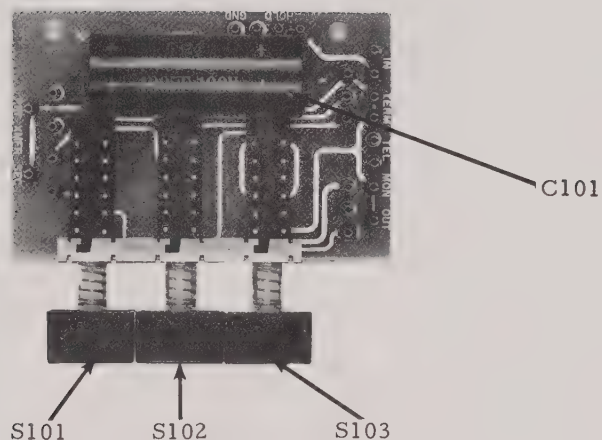


Fig. 6-9 Component Location E14-085-10-017

PC Bd. E-14-085-10-017-Hold Network

Ref Desig.	Description	Manufacturer (FSCM Code #)	Part Number
C101	C: 100 μ F 100V non-polar	22650	32-750-100-100BNA
S101 to 103	S: push/push pushbutton	71590	PB-20

SECTION 7

SCHEMATIC DIAGRAMS

7.1 INTRODUCTION. The following pages
contain the schematic diagrams for the TTS 85A.

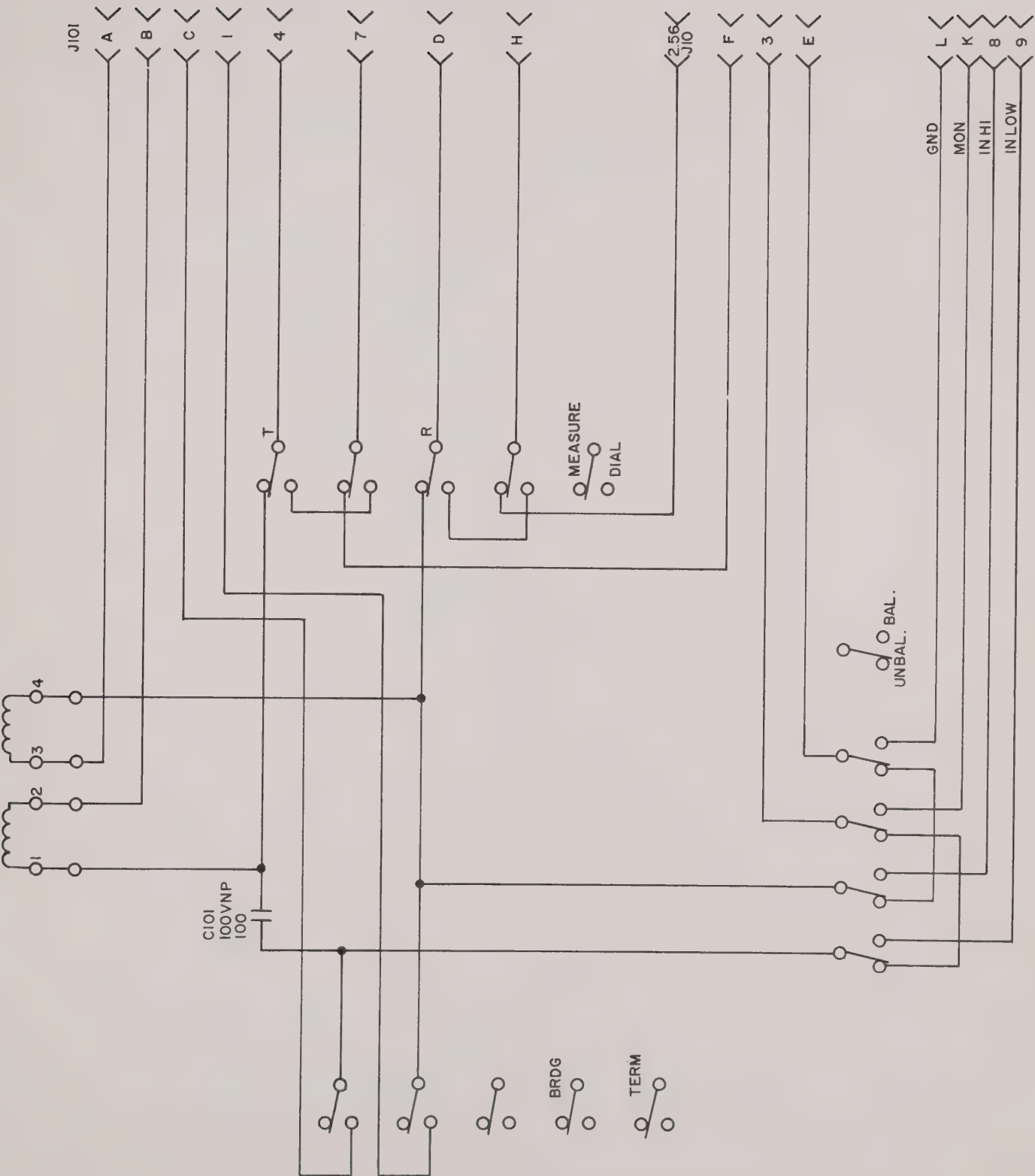


Figure 7-8 Schematic Diagram E-1408510-017

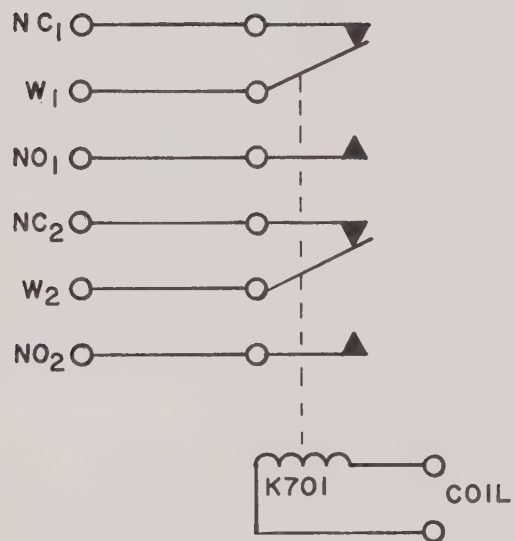


Figure 7-9 Schematic Diagram E95317

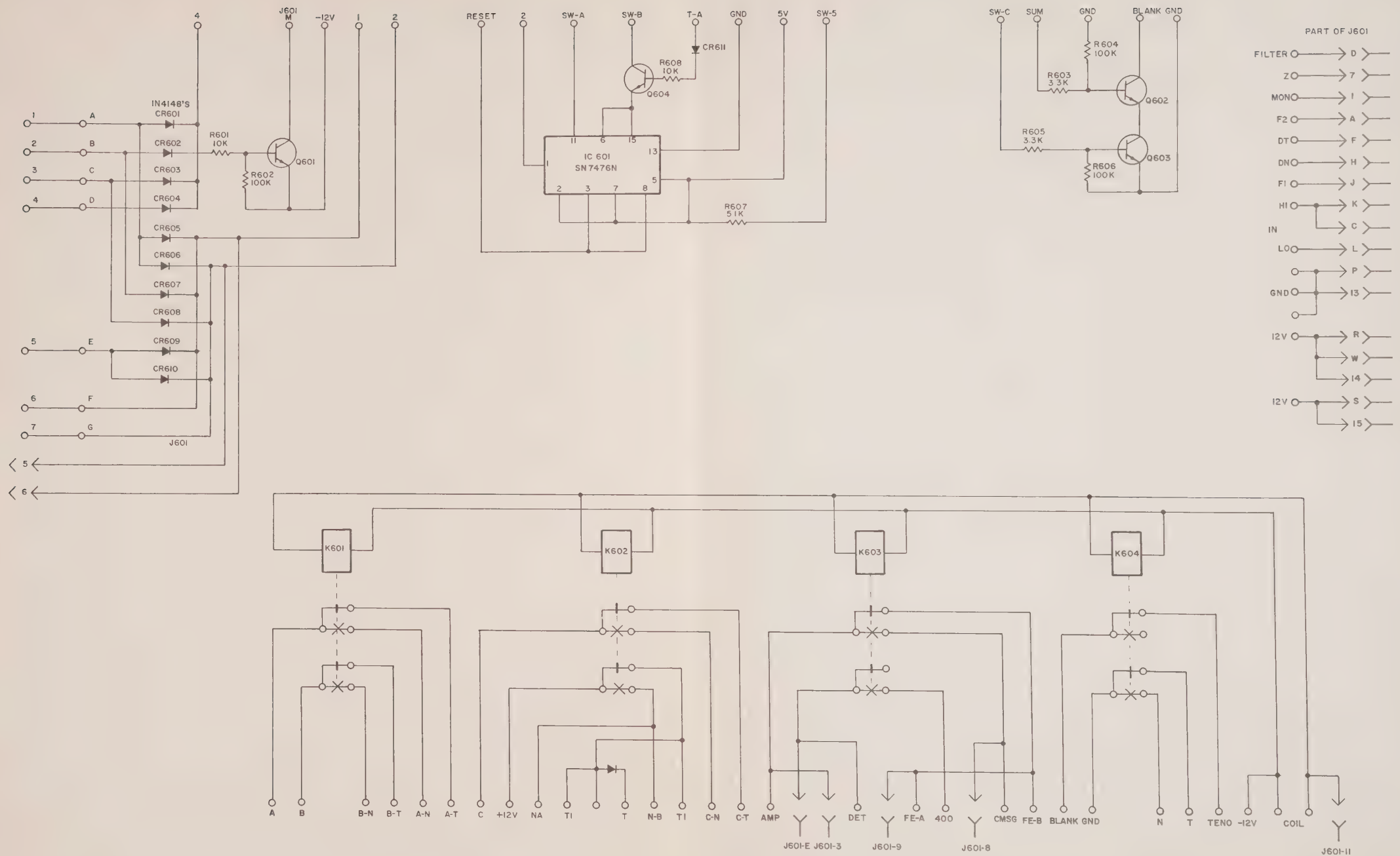


Figure 7-7 Schematic Diagram E95250

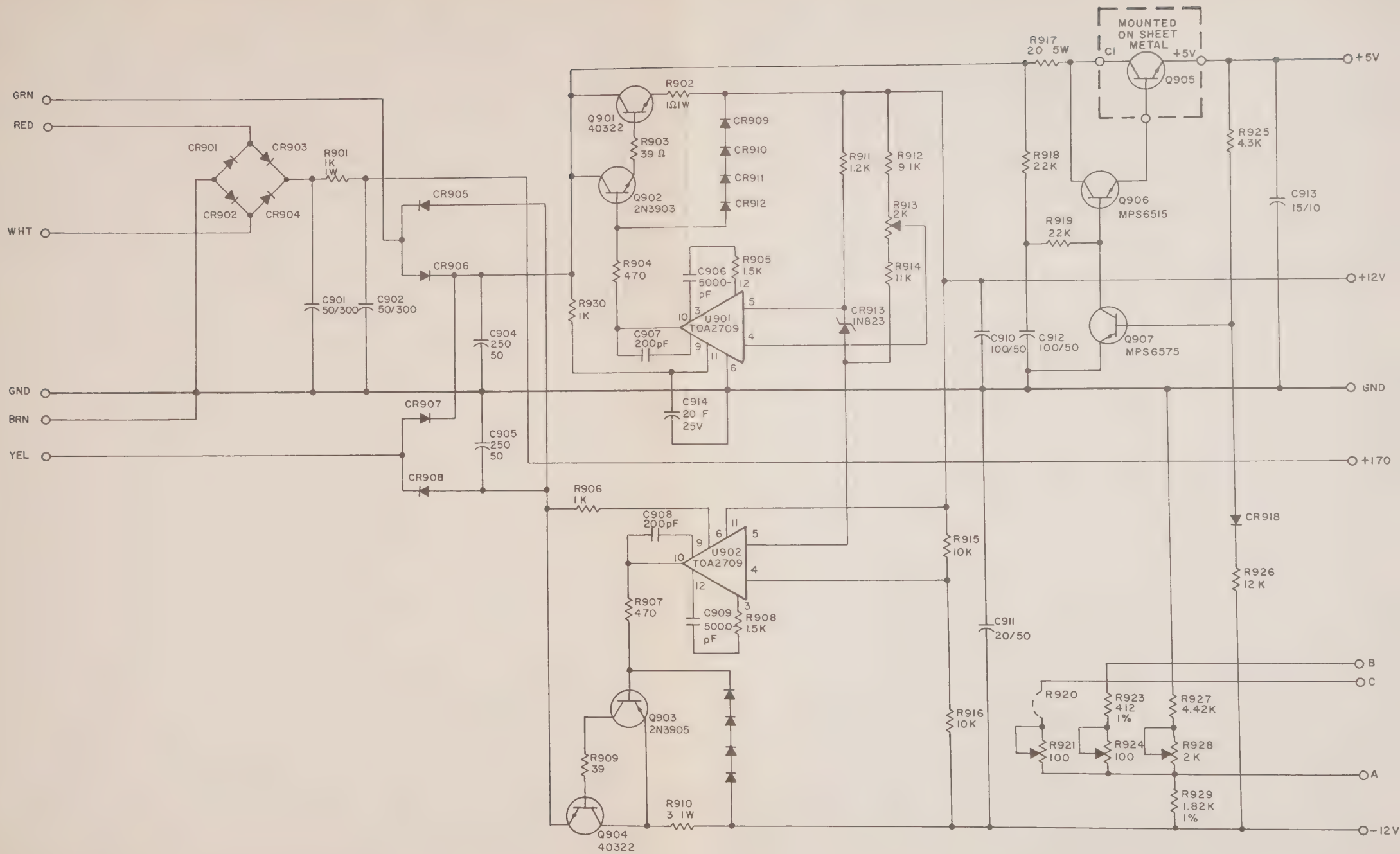


Figure 7-6 Schematic Diagram E95240

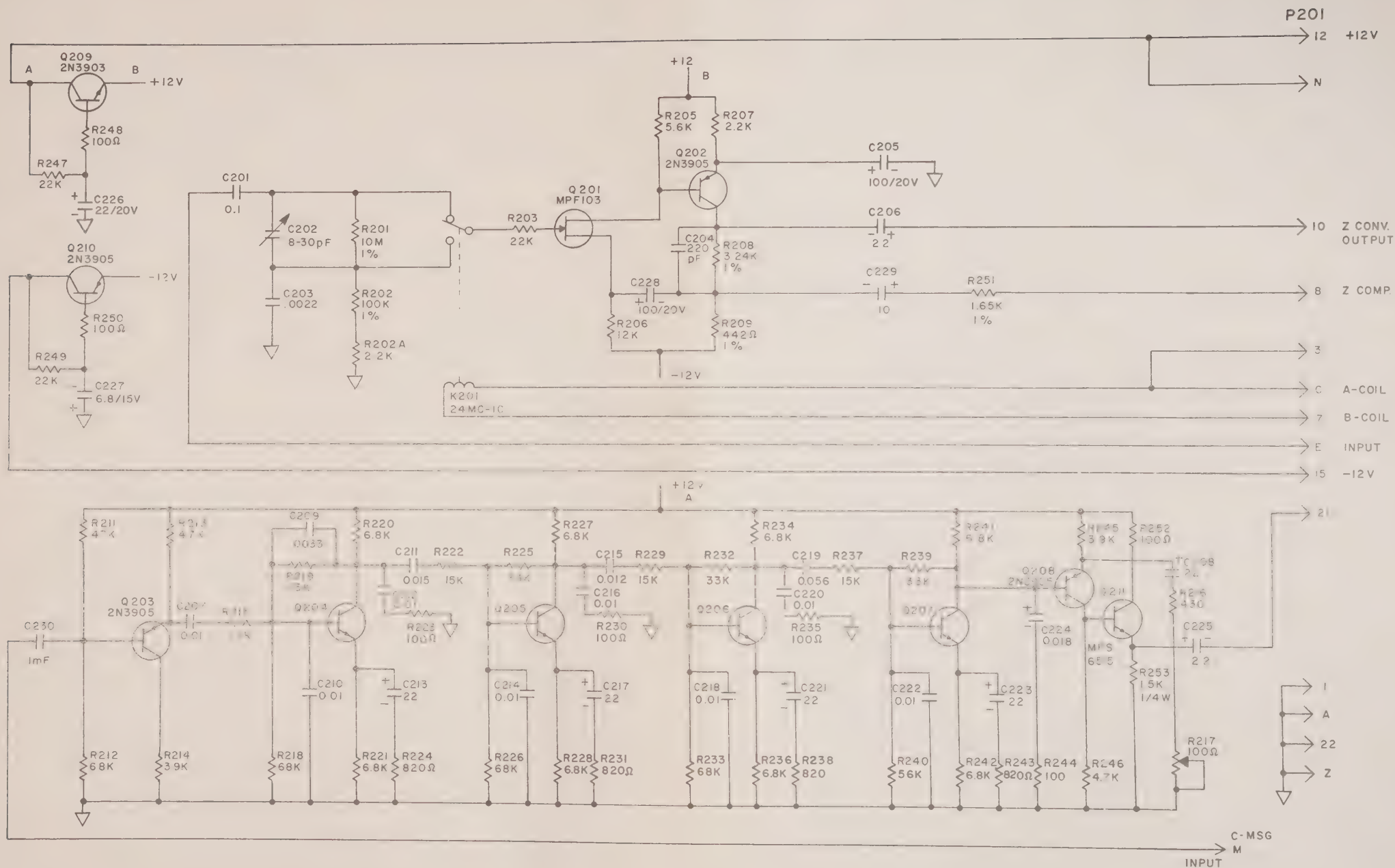


Figure 7-4 Schematic Diagram E95235

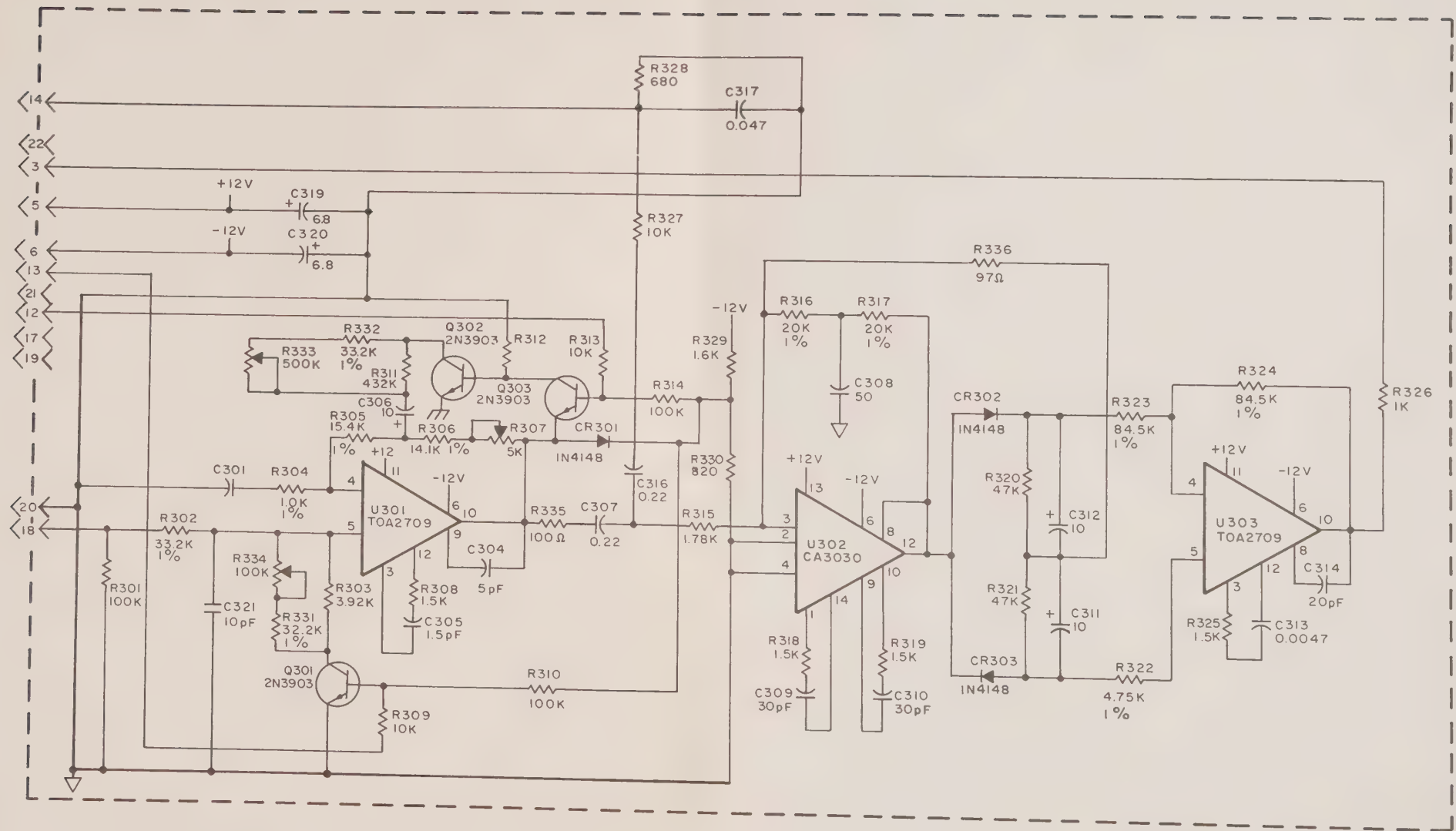


Figure 7-3 Schematic Diagram E9522

